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ABSTRACT

The teaching activities presented in this document focus on teaching students the language of mathematics through reading and writing. The first activity teaches students about space, time, numbers, and languages by having them give directions to a robot, compare distances traveled, read a map, and write a story with illustrations about a robot. The second activity develops students' math concepts, while exercising the critical ability of distinguishing between the general and the specific, by coupling numbers with words that create visual images (two poodles plus two beagles equals four dogs). The third activity uses newspaper grocery ads as an example of environmental print and requires students to analyze and add prices and develop menus. The last activity uses the telephone to engage students in reading rate charts, solving problems, and computing costs. (HTH)

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Language Everywhere--Math

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CS 209 371

Language Everywhere

MATH

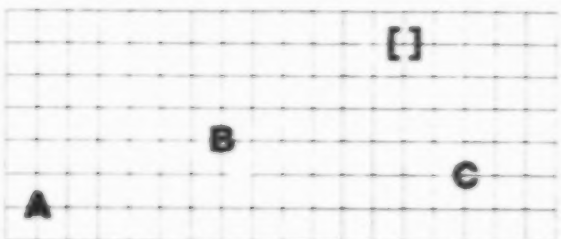
Robot Walk

Children learn best about space, time, numbers, and language if they can "experience" them in some way. For that hands-on experience, use the Robot Walk in kindergarten and primary classes to:

- introduce the language of math *(more than, less than, equal to)*
- use precise language *(left rather than over there)*
- practice spatial concepts *(left/right and up/down)*

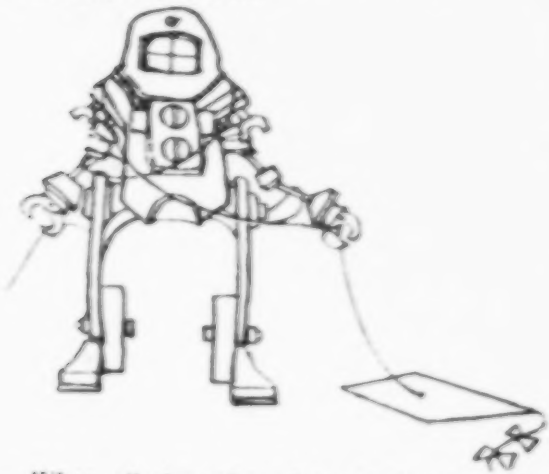
In this activity, students give directions to the robots, compare distances traveled, read a map, and extend the robot theme by writing a story and drawing illustrations.

Before class, draw a simple grid on the chalkboard like the one below. Label some points on the grid with familiar places in your neighborhood or town. Mark the locations of three robots. (If you have magnetic letters for your board, you can easily move them when students are giving directions to the robots.)



Begin by asking students to share their ideas of what a robot is. Have they ever seen a real robot? A make-believe robot on television or in the movies? What about C3PO and R2D2? Students can use their own language to talk about what robots look like and what they can do.

Now move on to the grid and ask students to direct these imaginary robots. They choose one destination for all three robots—a school, park, store, or any other landmark on the grid. Each robot must then take the shortest route to the destination. Students tell the robot to walk one block right, two blocks up, and so on. Try several routes for each robot, counting blocks to find the shortest route.



When all the robots have "walked" to the destination, compare the distances. Which robot walked the longest distance? The shortest? How many more blocks did the first robot walk than the second or third? Have students talk about how they figured out the answers.

There are many possibilities for extending the robot theme; most will be suggested by the students themselves. One idea is to have students write about the robots' walk. What happened when one robot was walking or after it arrived at the destination? What was the robot "thinking"? Encourage students to draw or describe what their story-robots look like.

(The idea for the Robot Walk comes from Comprehensive School Mathematics Program, CEMREL, Inc., © 1976. Used by permission of CSMP Mathematics for Kindergarten, Midcontinent Regional Educational Laboratory.)

Shirley R. Crenshaw with Constance Guy, Robert E. Lee School, Columbia, Missouri

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Adding Words and Numbers

By coupling numbers with words that create visual images, this activity develops math concepts while exercising a critical language ability—that of distinguishing between the general and the specific. "Two poodles" plus "two beagles," for instance, equals "four dogs." "Four maples" plus "eight oaks" equals "twelve trees."

This exercise can be adapted to any age level by using larger or smaller numbers than are shown here, or by choosing easier or more difficult terms. If your students feel comfortable using the actual numerals, feel free to use them in writing your problems.

First, put a few sample problems on the board, such as the following:

four roses	three apples
+	+
four tulips	seven strawberries
eight _____	_____ pieces of fruit
(answer: flowers)	(answer: ten)

Discuss the two problems with the students. Be sure that they grasp both the math problem and the language problem involved.

Next, demonstrate some other ways to write a problem:

1.	ten cardinals	3.	_____ cardinals
	+		+
	ten robins		ten robins
	_____ birds		twenty birds
2.	ten _____	4.	ten cardinals
	+		+
	ten robins		ten robins
	twenty birds		twenty _____

Talk about the process used in answering. What question must you ask to answer Problem 1? What must you ask to answer Problem 2? Problem 3? Problem 4? Which is a larger category—cardinals or birds?

When you are sure that the students understand the relationship between the terms in the problem (specifics) and the term in the answer (general), give each student a sheet of five to ten problems with blanks for answers, such as:

fourteen ants
+
three beetles
_____

Begin by having the students work in pairs or in small groups in order to help one another. Then, distribute the following list of terms and ask students to write their own problems with blank answers. Have students exchange papers and try to solve their classmates' problems.

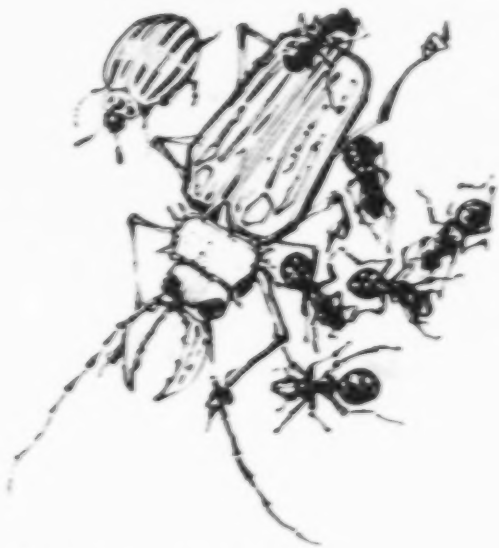
bass, trout, salmon, tuna (fish)

cardinals, sparrows, robins, hawks (birds)

beetles, flies, ants, mosquitoes (insects)

aunts, cousins, brothers, sisters (relatives)

diamonds, emeralds, rubies (gems)



lunch, breakfast, dinner (meals)

boxes, jars, pots, tins (containers)

bats, kneepads, baseballs, helmets (sports equipment)

rats, mice, weasels, gophers (rodents)

Students are now ready to invent their own specific and general terms for a "sum" exchange. Individual students will enjoy making up their own problems and solving others' problems.

This idea was submitted by an anonymous contributor.

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Language Everywhere

MATH

Shoppers' Special

Newspaper ads are one of many kinds of environmental print, that world of words surrounding us daily. Local grocery ads are a natural resource for bringing real-world occasions for reading and computing into the classroom.

Bring to the class three or four different double-page grocery ads from a recent local newspaper. Familiar items (bread, frozen orange juice, milk) will be offered by several stores, and you'll want to include ads with such duplicates. Post the ads on a bulletin board that is easily accessible.

On a set of numbered cards write problems—one to a card—that are based on prices in these ads. The problems will, of course, reflect the grade level of your students, and you can tailor the questions to include math skills you are currently emphasizing: decimal addition, percentages, division, two-step solutions. You may want to write problems similar to the following:

1. At what store would you shop to obtain the lowest total price for these six items: lettuce, oranges, canned ham, cottage cheese, saltines, celery?
2. Find the total cost for the following grocery list, assuming that you buy the items at Joe's Grocery: margarine, cottage cheese, eggs, milk, frozen corn, fresh spinach, lettuce, tomato paste, sugar, vinegar.
3. You need frozen orange juice, onions, vegetable oil, and chicken, and you are willing to drive from one store to another in order to buy each item at the lowest possible price. First, find out how much it would cost to buy all four items at one store. Then find out how much it would cost to buy each item at whatever store has the lowest price. In doing so, you drive eight miles at a cost to you of 11¢ a mile. How much will you save or lose by driving from store to store?

The grocery ad display can be used in a second small group activity. Divide the class into groups of four or five. Appoint a meal planner who assigns two items that appear in one or more of the ads to each member of the group. Taken together, these six or eight items must make a reasonable meal. Group members then go to the bulletin board to look for the lowest price available for each of their assigned items. When they return, they record those prices and find the cost of the meal. When everyone agrees on the answer, a new meal planner takes over and sends group members back to the ads to find the lowest prices for a new menu. After each member has had a turn to plan a meal, the group chooses its favorite menu.

Follow up with talk about the menus. Do favorite menus tend to be expensive menus? If so, why? Discuss the nutritional balance of these meals using information students have learned in science or health and at home.

Sandra Pryor Clarkson, Math Learning Center, Hunter College, New York

February 1985

Language Everywhere

MATH

Telephone Talk

Whatever would we do without the telephone? We use it for communications of all sorts, for everything from checking the weather report to delivering long-distance birthday greetings. By the time that children reach first or second grade, they rely on the telephone for their own purposes—checking homework assignments, requesting movie times, finding out the time and temperature—and are ready to learn what is involved in owning a phone through a math and language activity that uses the telephone directory as a resource.

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"Telephone Talk" engages students of any grade level in reading charts, solving problems, and computing costs. Students learn both about telephone service and about math concepts by using language in the following ways:

- thinking and talking about the different types of long-distance telephone calls
- examining and discussing the long-distance rate chart provided in the telephone directory
- computing the answers to word problems, using the rate chart
- writing and exchanging word problems

First, you will need to ask the telephone company that handles local and in-state service for enough copies of the local telephone directory so that each student has one to examine. (You can photocopy the necessary pages, but it's preferable to present the chart and information in the context of the directory.) Before the class period, examine the chart for determining the cost of in-state calls. If you use this activity with upper elementary students, you may want to expand the discussion to include out-of-state calls as well.

Begin by writing the word *telephone* on the chalkboard or by displaying a picture of a telephone. (Glossy advertisements can sometimes be obtained from the telephone company.) Ask the class to tell you what they know about making long-distance telephone calls. This informal discussion serves as an introduction and lets you know how much students already understand. Ask students if any have made long-distance calls to friends or relatives. Do they know the difference between direct-dial calls and operator-assisted calls? Are they aware that one type of call is always cheaper?

Older students can make the distinction between in-state and out-of-state long-distance calls and may appreciate an explanation of the difference in cost between the two types. If your students are first or second graders, however, you will probably want to limit the discussion and problem solving to rates for in-state calls, such as those found in the rate chart in the front of the local telephone directory.

Direct students to the chart for in-state long-distance calls and describe the types of direct-dial calls: *weekday* direct-dial calls, *weekday evening* direct-dial calls, and *night and weekend* direct-dial calls. Before students examine the chart, ask them which of these three types of calls they would expect to cost the most. Then ask them to look at the chart and find out if they were right. Which type is least expensive? Why are calls cheaper at certain times? What is the additional charge for asking for the operator's help, that is, making an "operator-assisted" call, according to the information given? Continue the discussion until students have a basic understanding of the facts.

Next, divide the class into small work groups with three to five members each and give every group a list of problems such as those below. You will need to supply the names of cities in your state taken from the chart in your local telephone directory.

1. Suppose that you placed a call from your home to your aunt in ___(city)___. How much would it cost to talk for three minutes if you called her at 4:00 p.m. on Tuesday?
2. If you called the same aunt on Saturday afternoon and talked for five minutes, what would the charge be?

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3. If you talked to a friend in __(city)__ for ten minutes at 11:00 a.m. on Wednesday, and then at 10:00 that night you called the same friend and talked for fifteen minutes, what would be the total charge for your two calls?

4. How much would you save by making one twenty-five-minute call at 10:00 p.m. on Wednesday instead of the two calls described in the previous problem?

5. If you could spend only two dollars, how many minutes could you spend talking to someone in __(city)__ at noon on a weekday. How long could you talk if you called at midnight on a weekday?

The group members can check answers with each other, and if they have trouble answering a particular problem or do not agree on an answer, they should use the questions below to help them talk through the problem.

Can the problem be broken down into steps?

What is the first step you need to take?

What part of the rate chart must you look at to find the answer for this step?

What other steps must you follow to figure out the problem?

Next, each group can write its own word problems to be exchanged with other groups (keeping the answers on separate cards and supplying them only after the group has answered all the problems).

Depending on the grade level of the class and the interest shown by students, this activity could be expanded to include discussion of topics explained in the telephone directory, such as area codes and time zones, special telephone services, consumer rights, money-saving tips, and directory assistance.

Diane E. Bushner, Cambridge School Department, Cambridge, Massachusetts

April 1985

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